



A new species of Haliotidae (Mollusca, Vetigastropoda) in the Italian Pliocene

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KEY WORDS: Haliotidae, Gastropoda, new species, Pliocene, Tuscany, Italy.

ABSTRACT A remarkably rich and diverse macrofauna has been discovered associated to shelly pebbly-sands in the lower Pliocene shallow marine deposits outcropping near Rapolano (Siena province, Tuscany). *Haliotis bertinii* n.sp. is here described from this fossil assemblage, based upon a series consisting of seven fully to quasi adult shells. This remarkable new species got likely extinct because of the mid-Pliocene climatic deterioration.

RIASSUNTO *Haliotis bertinii* n. sp. viene istituita sulla base di sette esemplari, quasi tutti adulti, provenienti da una successione di ghiaie e sabbie di età pliocenica inferiore affiorante nei pressi delle Serre di Rapolano (Provincia di Siena, Toscana). Caratterizzata da una inusuale conchiglia distintamente ornata da coste rilevate, questa specie deve probabilmente la sua estinzione al raffreddamento medio-pliocenico.

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INTRODUCTION

Pliocene beds of the Italian peninsula are long known to be amongst the world's most productive sources of fossil molluscs. In spite of such richness and diversity, only one species belonging to the family Haliotidae Rafinesque, 1815 (Mollusca, Vetigastropoda), i.e., the Neogene-to-Recent *Haliotis tuberculata* Linné 1758, and its form *lamellosoides* Sacco, 1897, was reported so far for the Italian (and Mediterranean) Pliocene. Four additional species are recorded in the Mediterranean Miocene, i.e. *H. ovata* Michelotti, 1847 (Bonelli, 1827, ms), *H. monilifera* Michelotti, 1847 (Bonelli, 1827, ms) *H. anomiaeformis* Sacco, 1897 and *H. torrei* Ruggieri, 1990 (MICHELOTTI, 1847; SACCO, 1897; INZANI, 1983; RUGGIERI, 1990; CAVALLO & REPETTO, 1992). Recent excavations in lower Pliocene deposits of Tuscany (central Italy) have unearthed an astonishing mollusc assemblage containing four nominal taxa belonging to Haliotidae (abalones) including one species new to Science and described herein.

MATERIAL AND METHODS

Source of the material

The source of the material under study is a thin succession of sands and pebbly sands, outcropping along a steep slope at 'Serre di Rapolano', north of the small town of Rapolano, Siena province, Tuscany, 43°20,30'N, 11°35,89'E; this locality can be found in Carta Topografica d'Italia, 1994 (sheet n. 297, Sezione I, Castelnuovo Berardenga). The precise site (referred to as Stroncoli hereafter) is situated at c. 325 m above sea level, between Podere Marocco and Podere Stroncoli, at the confluence of the Borro di Stroncoli stream with an unnamed one (Fig. 1). The general area of Serre di Rapolano (and the locality known as Il Campino) is recorded in the palaeontological literature as a source of interesting Pliocene molluscs (LAGHI, 1984; SPADINI, 1986; ANDREOLI & MARSIGLI, 1997).

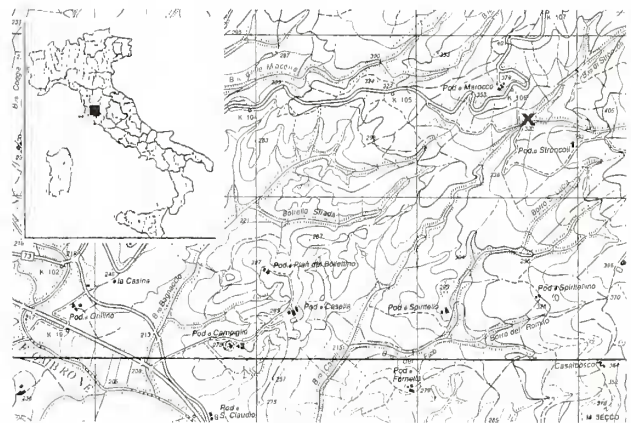


Fig.1 – Location map of the fossiliferous outcrop

This specific outcrop, however, apparently escaped the attention of research and amateur palaeontologists probably because located in a densely forested area.

The sequence consists of about 10 metres of fine to coarse, highly fossiliferous sands with an intercalated lens of shelly pebbly-sand (Fig. 2). Both lithologies contain diverse and well-preserved, shelled macrofaunal assemblages with prevailing molluscs, mostly concentrated within the pebbly sands (see Appendix). The assemblages are clearly dominated by species indicating very shallow, infralittoral-sublittoral provenances, as proven by the occurrence of *Lepidopleurus cajetanus* (Poli, 1791), *Lepidochitona caprearum* (Scacchi, 1836), *Lepidochitona cinerea* (Linné, 1767), *Ischnochiton rissoi* (Payraudeau, 1826), *Acanthochitona fascicularis* (Linné, 1767), *Haliotis* spp., *Patella* spp., *Gibbula* spp., *Monodonta turbinata* (Born, 1778), *Monodonta articulata* (Lamarck, 1822), *Nerita zatiinii* Bertarelli & Inzani, 1985, etc.

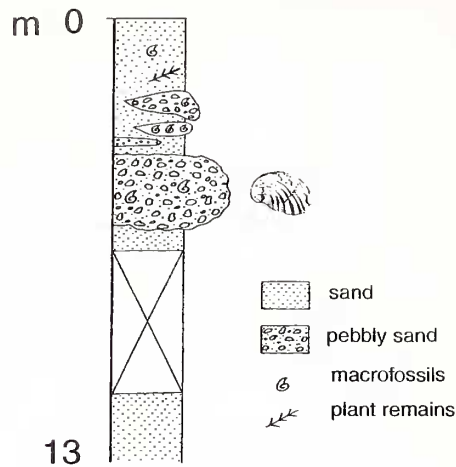


Fig.2 – Lithostratigraphic log

SYSTEMATICS

Order Vetigastropoda Salvini-Plawen, 1980

Family Haliotidae Rafinesque, 1815

Genus *Haliotis* Linné, 1758

Haliotis bertinii new species

(Pl. 1, Figs 1-6; Pl. 2, Figs 1-10)

Haliotis tuberculata var. *monilifera* Michelotti, 1847- Lecoindre, 1952: 88, pl.28, fig.14.

Description:

Shell relatively large for genus (up to 111 mm in length) auriform, robust, heavy sculptured. Apex close to edge of shell, not very elevated. Dorsal side of last whorl beginning slightly inflated then becoming progressively flat; ornamentation of last whorl consisting of 6 very prominent ridged, concentric, spiral cords, tuberculated; the first four regularly spaced, with inter-cord spaces grooved by minor and spaced striae; fifth corresponds to row bearing trematae, sixth corresponds to lateral margin carina, more protruding than fifth cord; space between cords 5 and 6 almost smooth, with exception of growth lines. Spiral cords poorly distinct and more numerous in early whorls, becoming remarkably elevated starting from mid part of last whorl; tremata conspicuously raised, scaled and prominent, even in juveniles; last four tremata completely opened, previous siphonal openings partially or completely closed, typically anteriorly-bent. Oblique, transverse ornamentation consisting of thin, close-spaced striae, barely corrugated surface. Columellar edge flat, expanded, merging into thin, arched labial margin.

Type locality: Serre di Rapolano, Siena province, Tuscany, 43°20,30'N, 11°35,89'E (Istituto Geografico Militare, 1994: Carta Topografica d'Italia, sheet n. 297, Sezione I, Castelnuovo

Berardenga); between Podere Marocco and Podere Stroncoli, at the confluence of the Borro di Stroncoli stream with an unnamed one.

Type material: Holotype, Zoological Museum, University of Bologna MZB 25046 (81,2 x 59 x 17 mm), Paratype 1 MZB 25047 (65 x 46 x 12 mm), paratype 2 MZB 25048 (incomplete). 3 Paratypes, temporarily deposited in the particular collection of F. Ciappelli (Paratype 3: 111 x 82 x 18,4 mm; Paratype 4: 107 x 78,8 x 21 mm; Paratype 5: 66,2 x 46,4 x 10,5 mm); 1 Paratype, temporarily deposited in the particular collection of D. Bertini (Paratype 6: 105 x 87 x ? mm).

Etymology: This species is named after Daniele Bertini, amateur palaeontologist and fellow of the Italian Malacological Society, who discovered this new taxon.

Stratigraphic and geographic distribution: early Pliocene: Italy (Tuscany: Stroncoli), Morocco (Agadir).

Comparisons:

The most distinctive character of this new species is the presence of very strong, spaced, and scaly concentric cords. There is little doubt that the shell figured by LECOINTRE (1952: pl. 28, fig. 14) from the Pliocene of Agadir, Morocco, and by this author incorrectly attributed to *H. tuberculata* var. *monilifera* Michelotti, 1847, belongs here. The Miocene taxon described by Michelotti can be separated from *H. bertinii* (similar in general outline and elevation) since its spiral cords are more numerous, considerably thinner, not continuous and displaying small nodules; the carina is shaped differently, and true tubercles over cords and tremata are lacking. *Haliotis anomiaeformis* introduced by SACCO (1897) from the Miocene beds of the Turin hills, shows similar tubercle-bearing cords, but it differs in shape and elevation of the shell. Unfortunately, Sacco's material is no longer traceable in the Bellardi-Sacco collection housed in the Turin Museum and the rather general original description and poor iconography (SACCO, 1897, pl. 1, fig. 15) prevent at this time any further evaluation of this elusive taxon. Among Recent taxa, none appears comparable to *H. bertinii* with the exception of *Haliotis jacnensis* Reeve, 1846 (see GEIGER, 1998: Figs 16-17, and 2000: fig. 124). The general shape and ornamentation of this Pacific species resemble those of *H. bertinii* but number, shape and disposition of spiral cords are different and the dimensions of the Recent taxon are much smaller.

CONCLUDING REMARKS

The discovery of a new species of a large-sized mollusc in the Italian Pliocene should be regarded as significant, considering how much work has been carried out in approximately two centuries of investigations in this territory by prominent scholars as Brocchi, De Stefani, Pantanelli and many others.

The present finding is remarkable also because the overall fossil documentation of family Haliotidae is rather meager (SOHL, 1992; GEIGER & GROVES, 1999).

Subtropical-tropical conditions are clearly suggested by the

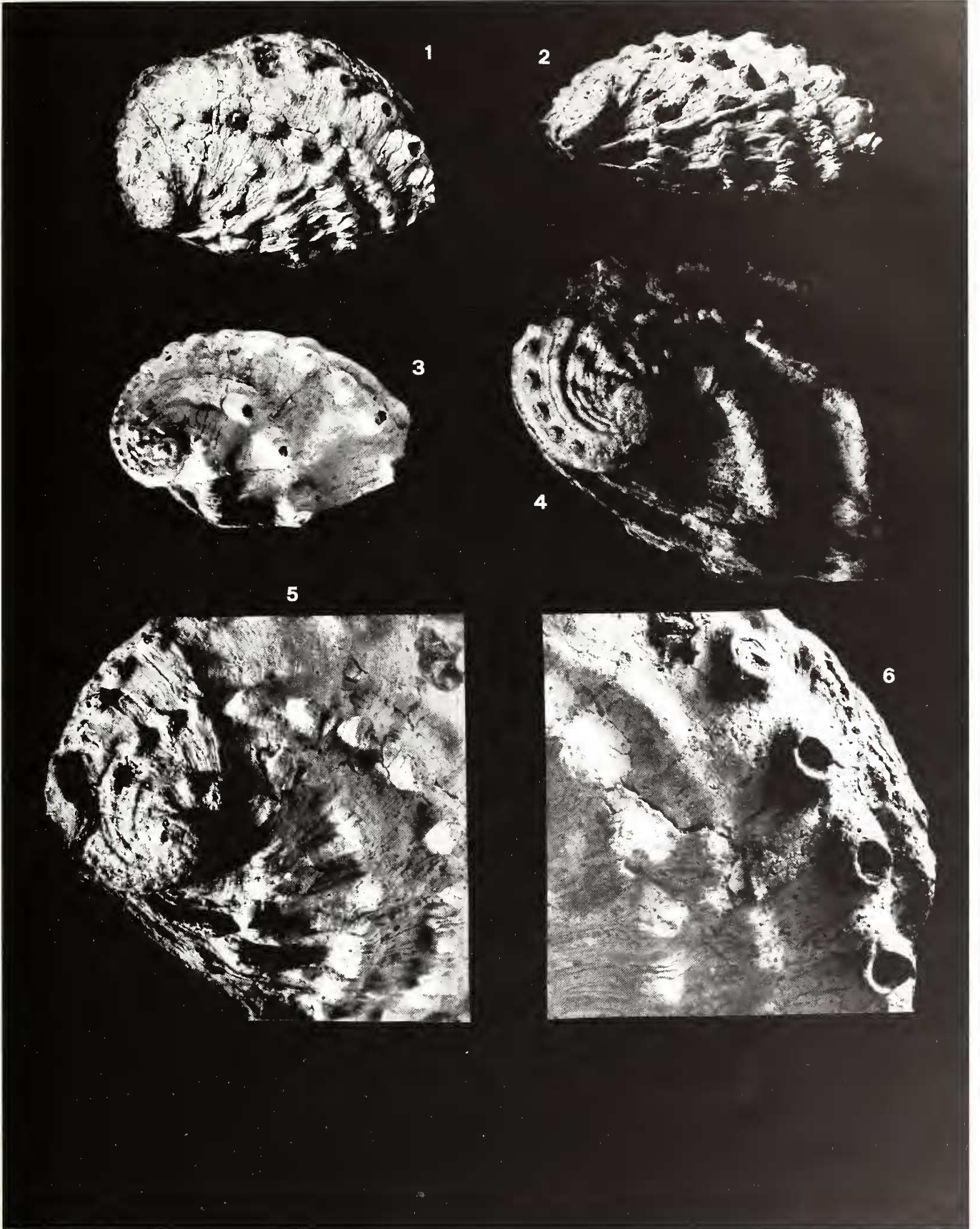


Plate 1 - Figs 1-6. *Haliotis bertinii* n. sp.; Figs 1,2,5,6: holotype; Fig.3: paratype 1; Fig.4: paratype 2.



occurrence of warm-water stenothermal taxa such as *Strombus coronatus* Defrance, 1827 among others. Therefore, *H. bertinii* can be considered as a warm-water species, likely becoming extinct as a result of the mid-Pliocene climatic deterioration responsible of a decimation of many stenothermal molluscs (e.g., RAFFI & MARASTI, 1982).

Haliotis bertinii does not seem to have any obvious link to the Recent European Atlantic abalone fauna, rather its closer relative (based upon shell features) dwells in the Pacific region (*H. jactensis*). As a working hypothesis, this species may be possibly regarded as belonging to a lineage inhabiting the Tethyan realm in the Miocene, becoming extinct in its western part during the lower Pliocene and restricted at present to the Pacific region.

ACKNOWLEDGEMENTS

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APPENDIX

Mollusca associated with *Haliotis bertinii* n.sp.

| SPECIES | sand | pebbly sand |
|---|------|-------------|
| Classis POLYPLACOPHORA | | |
| <i>Lepidopleurus cajetanus</i> (Poli, 1791) | x | x |
| <i>Lepidopleurus cancellatus</i> (Sowerby G.B.II, 1840) | x | |
| <i>Callochiton septemvalvis</i> (Montagu, 1803) | x | |
| <i>Ischnochiton rissoi</i> (Payraudeau, 1826) | x | |
| <i>Lepidochitona caprearum</i> (Scacchi, 1836) | x | |
| <i>Lepidochitona cinerea</i> (Linné, 1767) | x | |
| <i>Chiton saeniensis</i> Laghi, 1984 | x | x |
| <i>Chiton corallinus</i> (Risso, 1826) | x | |
| <i>Acanthochitona crinita</i> (Pennant, 1777) | x | |
| <i>Acanthochitona fascicularis</i> (Linné, 1767) | x | |
| <i>Craspedochiton altavillensis</i> (Seguenza, 1876) | x | |
| Classis GASTROPODA | | |
| Subclassis PROSOBRANCHIA | | |
| <i>Patella</i> sp. | | x |
| <i>Patella</i> cf. <i>caerulea</i> Linné, 1758 | | x |
| <i>Diodora graeca</i> (Linné, 1758) | x | |
| <i>Diodora italica</i> (Defrance, 1820) | x | |
| <i>Emarginula sicula</i> Gray, 1825 | x | x |
| <i>Emarginula solidula</i> Costa O.G., 1829 | x | |
| <i>Emarginella buzzardii</i> (Payraudeau, 1826) | x | |
| <i>Haliotis lamellosoides</i> Sacco, 1897 | x | x |
| <i>Haliotis bertinii</i> n.sp. | | x |
| <i>Haliotis</i> sp.1 | | x |
| <i>Haliotis</i> sp.2 | | x |
| <i>Clanculus cruciatus</i> (Linné, 1758) | x | |
| <i>Clanculus elevatus</i> Spadini, 1986 | x | |
| <i>Clanculus jussieui</i> (Payraudeau, 1826) | x | |
| <i>Clanculus</i> sp. | x | |

| SPECIES | sand | pebbly sand |
|--|------|-------------|
| <i>Calliostoma conulus</i> (Linné, 1758) | x | |
| <i>Gibbula adansonii</i> (Payraudeau, 1826) | x | |
| <i>Gibbula bertarellii</i> Andreoli & Marsigli, 1997 | | x |
| <i>Gibbula distefanoii</i> (Crema, 1903) | x | |
| <i>Gibbula richardi</i> (Payraudeau, 1826) | x | |
| <i>Gibbula semirotonda</i> Sacco, 1896 | x | x |
| <i>Gibbula substrigosa</i> (d'Orbigny, 1852) | x | |
| <i>Gibbula terrerossae</i> Spadini, 1985 | x | |
| <i>Gibbula turbinoides</i> (Deshayes, 1835) | x | |
| <i>Diloma patulum</i> (Brocchi, 1814) | x | |
| <i>Danilia sublimbata</i> (d'Orbigny, 1852) | x | |
| <i>Monodonta turbinata</i> (Born, 1778) | | x |
| <i>Monodonta articulata</i> (Lamarck, 1822) | | x |
| <i>Jujubinus striatus</i> (Linné, 1758) | x | |
| <i>Jujubinus exasperatus</i> (Pennant, 1777) | x | |
| <i>Tricolia pullus</i> (Linné, 1758) | x | |
| <i>Tricolia tenuis</i> (Michaud, 1829) | x | |
| <i>Nerita zatunii</i> Bertarelli & Inzani, 1985 | x | x |
| <i>Bolna rugosa</i> (Linné, 1767) | x | x |
| <i>Cerithium vulgatum</i> Bruguiere, 1792 | x | x |
| <i>Cerithium crenatum</i> (Brocchi, 1814) | x | |
| <i>Cerithium varicosum</i> (Brocchi, 1814) | x | |
| <i>Bittium reticulatum</i> (Da Costa, 1778) | x | |
| <i>Rissoina pusilla</i> (Brocchi, 1814) | x | |
| <i>Petalocochus glomeratus</i> (Linné, 1758) | x | |
| <i>Strombus coronatus</i> Defrance, 1827 | x | |
| <i>Calyptraea chinensis</i> (Linné, 1758) | x | x |
| <i>Crepidula unguiformis</i> Lamarck, 1822 | x | |
| <i>Xenophora infundibulum</i> (Brocchi, 1814) | x | |
| <i>Schilderia flavicula</i> (Lamarck, 1810) | | x |
| <i>Zonaria porcellus</i> (Brocchi, 1814) | x | |
| <i>Trivia dimidiata</i> (Bronn, 1831) | x | |
| <i>Erato voluta pernana</i> Sacco, 1894 | x | |
| <i>Natica tigrina</i> (Defrance, 1825) | x | |
| <i>Neverita josephina</i> Risso, 1826 | x | |
| <i>Sium striatum</i> De Serres, 1829 | x | |
| <i>Ficus communis</i> (Roding, 1798) | x | |
| <i>Cypraeacassis pseudocrumena</i> (d'Orbigny, 1852) | x | |
| <i>Monophorus perversus</i> (Linné, 1758) | x | |
| <i>Cerithiopsis</i> sp. | x | |
| <i>Epitonium</i> sp. | x | |
| <i>Bolinus brandaris torularius</i> (Lamarck, 1822) | x | |
| <i>Hexaplex trunculus conglobatus</i> (Michelotti, 1841) | x | x |
| <i>Ocenebra lassaignei ariesiana</i> (Fontannes, 1882) | x | x |
| <i>Ocenebra polymorpha</i> (Brocchi, 1814) | | x |
| <i>Tbais connectens</i> (Bellardi, 1882) | x | x |
| <i>Tbais hoernesiana</i> (Pecchioli, 1864) | x | x |
| <i>Nassarinus</i> sp. | x | |
| <i>Nassarinus angulatus</i> (Brocchi, 1814) | x | |
| <i>Mitra</i> sp. | x | |
| <i>Vexillum ebenus</i> (Lamarck, 1811) | x | |
| <i>Conus mercatii</i> Brocchi, 1814 | x | x |
| <i>Conus pyrula</i> Brocchi, 1814 | x | |
| <i>Conus</i> sp. | x | x |
| <i>Mangelia</i> sp. | x | |

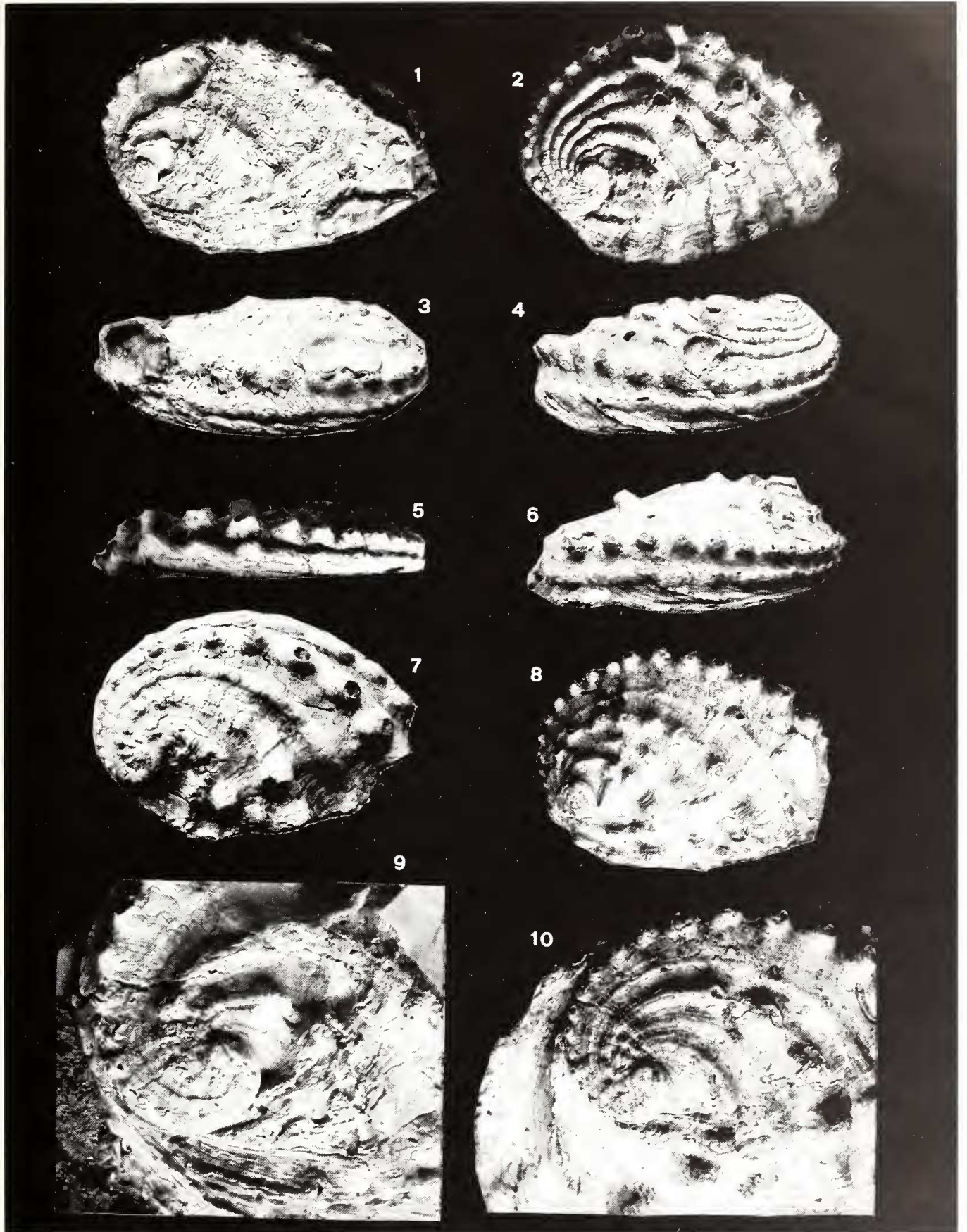


Plate 2 - Figs 1-10: *Haliotis bertinii* n. sp.; Figs 1,3,9: paratype 3; Figs 2,4: paratype 4; Figs 5,7: paratype 5; Figs 6,8,10: paratype 6.



| SPECIES | sand | pebbly sand | |
|---|------|-------------|--|
| Subclassis HETEROBRANCHIA | | | |
| <i>Heliacus thersae</i> (Semper, 1861) | x | | RAFFI S., & MARASTI R., 1982. The Mediterranean bioprovince from the Pliocene to the Recent: observations and hypothesis based on the evolution of the taxonomic diversity of molluscs. In: Montanaro Gallitelli (ed.) <i>Paleontology: Essential of Historical Geology</i> , Mucchi, Modena, 151-177. |
| Subclassis OPISTHOBANCHIA | | | |
| <i>Ringicula ventricosa</i> (Sowerby, 1825) | x | | RUGGIERI G., 1990. Una <i>Haliotis</i> del Miocene superiore (Sabeliano) della Sicilia. <i>Bollettino Malacologico</i> , 25: 349-354. |
| Classis BIVALVIA | | | |
| Subclassis PROTOBRANCHIA | | | |
| <i>Nucula</i> sp. | x | | SACCO F., 1897. <i>I Molluschi dei terreni terziari del Piemonte e della Liguria. Parte XXII. Gasteropoda (fine). Amphineura. Scaphopoda</i> . Carlo Clausen: 149 pp., Torino. |
| Subclassis PTEROMORPHIA | | | |
| <i>Barbatia scabra</i> (Poli, 1795) | x | | SOHL N.F., 1992. Upper Cretaceous gastropods (Fissurellidae, Haliotidae, Scissurellidae) from Puerto Rico and Jamaica. <i>Journal of Paleontology</i> , 66: 81-85. |
| <i>Striarca lactea</i> (Linné, 1758) | x | | |
| <i>Glycymeris insubrica</i> (Brocchi, 1814) | x | | |
| <i>Chlamys multistriata</i> (Poli, 1795) | x | | SPADINI V., 1986. Contributo alla conoscenza dei Trochidae (Gastropoda: Archaeogastropoda) del , Senese: specie nuove o poco conosciute. <i>Bollettino Malacologico</i> , 22: 85-90. |
| <i>Chlamys pesfelis</i> (Linné, 1758) | x | x | |
| <i>Spondylus gaederopus</i> Linné, 1758 | | | |
| <i>Anonta ephippium</i> Linné, 1758 | | | |
| <i>Pododesmus patelliformis</i> (Linné, 1761) | x | x | |
| <i>Cubitostrea frondosa</i> (De Serres, 1829) | | | |
| Subclassis HETERODONTA | | | |
| <i>Codakia leonina</i> (Basterot, 1825) | x | | |
| <i>Ctena decussata</i> (Costa O. G., 1829) | x | | |
| <i>Cardita calyculata</i> (Linné, 1758) | x | | |
| <i>Chama gryphoides</i> Linné, 1758 | x | | |
| <i>Pseudochama gryphina</i> (Lamarck, 1819) | x | | |
| <i>Chamelea gallina</i> (Linné, 1758) | x | | |
| <i>Callista italica</i> (DeFrance, 1818) | x | | |
| <i>Callista puella</i> (Philippi, 1814) | x | | |

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